Patent Claims:

1. Mass spectrometer for analysis of secondary ions and post-ionized neutral secondary particles with an ion source to create a primary ion beam to irradiate a sample and create secondary particles, said source possessing a heatable ion emitter that is coated in the area exposed to the field with a liquid-metal layer that contains an ionizable metal that is emitted and ionized as the primary ion beam, whereby the primary ion beam contains metal ions with various stages of ionization and cluster statuses, and with a spectrometer unit for mass analysis of the secondary particles, characterized in that the liquid metal layer is essentially comprised of pure metallic Bismuth or of a low-melting-point alloy containing, in essence, Bismuth, whereby a Bismuth ion mixed beam can be emitted by the ion emitter under the influence of an electric field and from which Bismuth ion mixed beam one of a number of Bismuth ion types, whose mass is a multiple of monatomic singly or multiply charged Bismuth ions Bi_1^{p+}, is to be filtered out using a filtering device in the form of a mass-pure ion beam that is solely comprised of ions of a type Bi_n^{p+}, in which $n \geq 2$ and $p \geq 1$, and n and p are each a natural number.

2. Mass spectrometer as in Claim 1, characterized in that the ions filtered out for a mass-pure ion beam belong to one of the following types: Bi_2^+, Bi_3^+, Bi_3^{2+}, Bi_4^+, Bi_5^+, Bi_6^+, Bi_5^{2+}, or Bi_7^{2+}.

3. Mass spectrometer as in Claim 1 or 2, characterized in that the secondary ion mass spectrometer may be operated as a flight-time secondary-ion mass spectrometer.

4. Mass spectrometer as in one of the previous claims, characterized in that the emission current of the primary-ion beam during operation be between 10^{-8} and 5×10^{-5} A.

5. Mass spectrometer as in one of the previous claims, characterized in that a metallic alloy of Bismuth and one or more of the following metals: Ni, Ag, Pb, Hg, Cu, Sn, or Zn, whereby an alloy is preferably selected whose melting point lies below that of pure Bismuth.

6. Ion source to create a primary ion beam to irradiate a sample, and to create secondary particles for a mass spectrometer for analysis of secondary ions and post-ionized neutral secondary particles, said source possessing a heatable ion emitter that is coated in the area exposed to the field with a liquid-metal layer that contains an

ionizable metal that is emitted and ionized as the primary ion beam, whereby the primary ion beam contains metal ions with various stages of ionization and cluster statuses, and with a spectrometer unit for mass analysis of the secondary particles, characterized in that the liquid metal layer is essentially comprised of pure metallic Bismuth or of a low-melting-point alloy containing Bismuth, whereby a Bismuth ion mixed beam can be emitted by the ion emitter under the influence of an electric field, from which Bismuth ion mixed beam one of a number of Bismuth ion types, whose mass is a multiple of monatomic singly or multiply charged bismuth ions Bi_1^{p+}, is to be filtered out using a filtering device in the form of a mass-pure ion beam that is solely comprised of ions of a type Bi_n^{p+}, in which $n \geq 2$ and $p \geq 1$, and n and p are each a natural number.

7. Ion source as in Claim 6, characterized in that a metallic alloy of Bismuth with one or more of the following metals is selected as a liquid metal coating: Ni, Ag, Pb, Hg, Cu, Sn, or Zn, whereby an alloy is preferably selected whose melting point lies below that of pure Bismuth.